**New Hampshire Regional Haze SIP Revision**
**Responses to EPA's Comments**

On December 20, 2010, the New Hampshire Department of Environmental Services (NHDES) received comments from the U.S. Environmental Protection Agency (EPA) on New Hampshire's draft final Regional Haze SIP, November 19, 2010 . The following are NHDES's responses to EPA's comments. **Comments are written in *italics* and responses are written in regular font.**

## Low-Sulfur Fuel Strategy

*1) New Hampshire's proposed SIP includes a demonstration that the MANE-VU low sulfur fuel oil strategy is reasonable…New Hampshire, however, has not yet adopted a regulation imposing these requirements. The proposed SIP indicates that New Hampshire plans to introduce legislation on this issue in January 2012. EPA urges New Hampshire to move forward with this strategy more quickly than stated in this proposal and include in its final SIP submittal a commitment to adopt and submit a final rule to EPA by a date certain in 2011.*

- **NHDES Response:** NHDES cannot make commitments as to the timing of legislation but will recommend new legislation to implement the low-sulfur fuel oil strategy, as envisioned in the MANE-VU low-sulfur fuel strategy, as soon as fuel supply and cost data are deemed sufficient and favorable for legislative success. It remains New Hampshire's goal to implement the MANE-VU strategy by 2018, in accordance with the original timetable. If, in EPA's view, this statement of intention is insufficient, NHDES will remove the low-sulfur fuel strategy from the regional haze SIP.

## BART Visibility Modeling

*2) Tables 9-4 and 9-5 show the results of CALPUFF modeling for the visibility improvement from BART controls on the 20% worst visibility modeled days, based on baseline visibility conditions, at each nearby Class I area. However, 40 CFR Part 51, Appendix Y, Section (IV)(D)(5), "Step 5: How should I determine visibility impacts in the BART determination?" clearly states:*

> *"Use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled (for the pre-control scenario). Calculate the model results for each receptor as the change in deciviews compared against natural visibility conditions."*

*A BART analysis should determine the visibility impact of the source, not the impact of the source in conjunction with all other impacting sources. New Hampshire must recalculate the visibility improvement using the calculated worst 20% natural conditions: 12.4 deciviews (dv) for Acadia National Park; 11.7 dv for Lye Brook Wilderness; and 12.0 dv for Moosehorn Wilderness and Great Gulf Wilderness.*

- **NHDES Response:** NHDES has adjusted the visibility modeling for BART and made corresponding revisions to the descriptive text and tables of the regional haze SIP and BART analyses. Please see the attached CALPUFF Modeling Assessment.

**Newington Station NT1 BART – $SO_2$**

*3) Based on the "Final Proposal" of Env-A 2300 "Mitigation of Regional Haze," posted on your web site and dated December 1, 2010,…it appears that NH DES has made a final decision that BART for NT1 is an $SO_2$ emission limit of 0.5 1b/MMBtu on a 30-day rolling average basis. EPA has previously expressed concerns with such a limit since it is not consistent with the MANE-VU recommended level for BART $SO_2$ control for non-CAIR EGUs, which is the use of natural gas or 0.3% sulfur content by weight fuel oil. The final SIP must include additional documentation to support an $SO_2$ BART limit of 0.50 lbs per million BTU for NT1.*

*Specifically, the BART Analysis for PSNH Newington Station Unit NT1 (Attachment X), Table 2-5, Cost of Fuel Switching based on Historical Fuel Oil Prices indicates the cost of switching from 2% to 0.3% sulfur in fuel oil as ranging from $627 to $2,664 per ton, which is not unreasonable. As noted in comment #2, New Hampshire must re-calculate the visibility improvements associated with each control strategy. Although the costs of switching to 0.3% sulfur in fuel oil may be reasonable, it is appropriate to consider these costs along with the anticipated visibility improvement. A minimal additional visibility improvement for 0.3% sulfur in fuel oil would provide support for New Hampshire's proposed 0.5 lb/MMBtu limit.*

- **NHDES Response:** NHDES believes that 0.50 lb/MMBtu is appropriate as the BART control level for $SO_2$ for this unit. This determination is based on a number of factors, the following in particular:

  - The availability and cost of 0.3% sulfur residual fuel oil remain uncertain, i.e., Newington Station cannot be assured of a steady supply of this fuel at reasonable cost over the next 5-10 years.

  - The plant has a sizeable quantity of higher-sulfur residual fuel oil in storage tanks on site. There is no practical way to offload and replace this inventory with a lower-sulfur residual fuel oil, so the existing stock of higher-sulfur fuel oil will have to be used up before Unit NT1 can be fired exclusively with low-sulfur fuel oil.

  - Even if supplies could be guaranteed at reasonable cost, the visibility improvement in going from an emission limit of 0.50 lb/MMBtu to a fuel limitation of 0.3% S residual fuel oil is almost negligible. Please refer to the revised modeling results for Unit NT1 in Table 5-1 of the BART analysis (Attachment X).

*In addition, there are inconsistencies between the final BART limits in Env-A 2300 and the proposed November 19, 2010 New Hampshire Regional SIP that need to be addressed. Those inconsistencies are:*

*a) The $SO_2$ BART emission limit in Table 9.3 is stated as a calendar month average.*
*b) The $SO_2$ BART emission limit in Table 9.7 is stated as a calendar month average.*

- **NHDES Response:** The inconsistencies between Env-A 2300 and the SIP have been corrected in the final documents.

*4) For Table 9.3, New Hampshire's initial proposal (dated May 26, 2009) included a 1,742 ton per year (tpy) $SO_2$ reduction from NT1. In the January 2010 SIP submittal and the November 19, 2010 proposal, Table 9.3 indicates a 3,484 tpy $SO_2$ reduction from this unit. However, Table 11.2 of the January 2010 SIP submittal and the November 19, 2010 proposal were not updated to reflect this change.*

- **NHDES Response:** The projected emissions in Table 11.2 represent MANE-VU's 2018 "Best and Final" modeling emissions inventory that was used in the final visibility modeling and reflect the assumptions used at the time the modeling was performed. This inventory incorporates the additional reasonable control measures, including the targeted EGU strategy, the low-sulfur fuel strategy, and the timely implementation of BART. For the targeted EGU strategy for Unit NT1 specifically, a 50% reduction in $SO_2$ emissions was assumed, representing a switch from 2% to 1% sulfur fuel. This emissions inventory and modeling analysis, and therefore the values in Table 11.2, were not adjusted to reflect revisions made by NHDES to the BART analysis between the time of the initial proposal and the January 2010 submittal. Thus, the table remains consistent with the completed MANE-VU modeling. Note, however, that the BART emission limit and expected emission reductions for Unit NT1 in the January 2010 SIP submittal are more stringent than those that were assumed in the final MANE-VU visibility modeling. NHDES has added a statement in the SIP to explain these differences.

**Newington Station NT1 BART – PM**

*5) New Hampshire has proposed that the existing PM permitted rate of 0.22 lb/MMBtu is BART for NT1. As noted in EPA's previous comments, this limit is well above the MANE-VU recommended limit of 0.02-0.04 lb/MMBtu. In the discussion of current PM emissions and controls, it is mentioned that NT1 has an electrostatic precipitator to capture PM emissions and a previous stack test at this facility indicated an emission rate 0.058 lb/MMBtu. At this point, DES has not presented sufficient evidence that the existing PM limit represents BART for unit NT1. The final SIP submittal must include further technical justification to demonstrate why it is not feasible for this unit to meet a more stringent limit.*

- **NHDES Response:** The single available stack test report for this unit is a decade old and is not a sufficient basis for resetting the PM emission limit. As indicated in the BART analysis of Attachment X, the facility's Title V operating permit requires that a compliance stack test for PM emissions be performed on Unit NT1 before the permit expires on March 31, 2012. In recent years this unit has operated as a peaking plant. It is impractical to fire up the boiler for the sole purpose of stack testing. Therefore, some flexibility is needed with respect to the testing schedule. PSNH and NHDES will coordinate the effort to perform the testing at the earliest practical date but cannot commit to a specific test schedule under current circumstances. NHDES will review the new stack test results to ascertain the unit's performance and incorporate any new limit into a permit amendment by the permit expiration date, as appropriate. Such limit will be made consistent with BART requirements. The permit expiration date precedes the effective date of proposed BART control measures by fifteen months, so the air quality benefits of a reduced PM emission limit will be realized earlier than would otherwise be the case under New Hampshire's BART implementation schedule.

**Merrimack Station MK2 BART – NOx**

*6) Based on the "Final Proposal" of Env-A 2300 "Mitigation of Regional Haze," posted on your web site and dated December 1, 2010, it appears that NH DES has made a final decision that BART for MK2 is a NOx emission limit of 0.30 lb/MMBtu on a 30-day rolling average basis.*

*This is more stringent than the NOx emission rate that was originally proposed in Env-A 2300. However, as stated in our comments dated November 22, 2010, it appears MK2 is capable of meeting NOx emission rates lower than this on a 30-day rolling average. Specifically, data available from EPA's Clean Air Markets Division data base indicates that, in 2009, at no point did the unit exceed a 30-day rolling average of 0.25 lbs per million BTU. A level of 0.25 lbs NOx per million BTU on a 30-day rolling average seems to be an appropriate BART emission limitation for MKl based on our evaluation of the performance of the SCR over the last 5 years through September 30, 2010. In fact, prior to MK2 coming back on line in November 2009, the 30-day rolling average NOx emission rate met by the SCR was generally below 0.20 lbs per million BTU.*

*Moreover, it is unclear the basis of the statement in Attachment X saying that "the estimated costs of reducing the NOx limit to 0.34 lb/MMBtu (a reduction of 0.03 lb/MMBtu) would fall between $3,000 and $10,000 per ton of NOx removed," given that it does not appear that this rate has ever been exceeded in recent times. Therefore, in order to support a 0.30 lb per million BTU limit, further technical justification is necessary to demonstrate why it is not cost effective for this unit to meet a more stringent limit.*

- **NHDES Response:** In new data provided to support the BART analyses for Unit MK2 (see Attachment X), PSNH estimates that a reduction in the NOx emission limit to 0.30 lb/MMBtu (an effective reduction of 0.07 lb/MMBtu) would have an incremental cost of approximately $800 per ton of NOx removed, which falls within the generally accepted cost-effective range. At the same time, PSNH estimates that further reduction of the NOx emission limit to 0.25-0.30 lb/MMBtu would have diminishing returns, with an incremental cost per ton approximately one order of magnitude greater. In the context of BART requirements, NHDES finds that the higher costs associated with a NOx emission limit below 0.30 lb/MMBtu are not justifiable given the fact of negligible visibility benefit.

  NHDES concurs with EPA that Unit MK2 is likely to surpass this performance level routinely by a significant margin. However, the ability of this unit to perform at a lower NOx emission rate most of the time does not, by itself, constitute BART. The facility needs some flexibility to operate at higher emission levels during occasional reduced-load incidents, which drive up the average emission rate. It is reasonable to expect that Unit MK2, in order to comply with a BART emission limitation of 0.30 lb/MMBtu on a 30-day rolling average basis, will continue to operate well below this limit whenever it can so as to counterbalance the possible higher emissions that occur from largely unplanned periods of low-load operation. PSNH has stated, and the historical record suggests, that the company regularly operates at a target NOx emission rate that is 0.15 lb/MMBtu below the permitted limit.

  NHDES will be re-evaluating this unit for future compliance with NOx RACT requirements, which could be more stringent than BART. The BART analyses, whose intent is visibility improvement, will remain separate from the NOx RACT review process. The latter will be undertaken to assure compliance with pending revisions to the ozone standards. Being health-based, the ozone standards serve a different, albeit related, purpose.

*In addition, there are inconsistencies between the final BART limits in Env-A 2300 and the proposed November 19, 2010 New Hampshire Regional SIP and attachments that need to be addressed. Those inconsistencies are:*

*a) The NOx BART emission limit in Table 9.2 is stated as 0.37 lb/MMBtu calendar*

*b) The NOx BART emission limit in Table 9.6 is stated as 0.37 lb/MMBtu calendar monthly average.*

*c) The discussion in section 6.1 of Attachment X saying that NHDES finds that the current NOx RACT limit, expressed as 0.37 lb/MMBtu, is also appropriate as a BART control level.*

- **NHDES Response:** These entries in the SIP have been updated to agree with the lower BART emission limit of 0.30 lb/MMBtu, 30-day rolling average basis.

**Implementing BART and Reasonable Further Progress Limits**

*7) The proposed SIP includes the following attachments for Merrimack Station and Newington Station:*

*Attachment EE - Temporary Permit for PSNH Merrimack Station*
*Attachment HH - Draft Title V Operating Permit for PSNH Merrimack Station*
*Attachment II - Title V Operating Permit for PSNH Newington Station*

*As noted in our November 22, 2010 comments, the temporary permit for Merrimack Station has expired and the Title V operating permit is in draft form. As such, these documents should not be incorporated into the SIP. Therefore, it is not clear how some of the BART and reasonable further progress emission limits for MK2 and MK1, respectively, will be made enforceable.*

- **NHDES Response:** Temporary Permit TP-0008 is a valid permit, reissued on August 2, 2010, with an expiration date of September 30, 2011. Future reissuance(s) will be made as necessary in accordance with Env-A 607.09 until such time as the relevant provisions of the temporary permit have been incorporated into the final Title V Operating Permit for Merrimack Station. The previously issued permits for this facility remain in effect because of a timely application filing for renewal. The proposed Title V Operating Permit for Merrimack Station has passed the public comment phase but is under appeal before the New Hampshire Air Resources Council. The appeal hearing is tentatively scheduled for February or March 2011. The Title V Operating Permit for Newington Station is valid until its expiration on March 31, 2012.

  Because the Title V Permit for Merrimack Station is the only permit in this group that is not final, it would appear to be the one most relevant to the question of enforceability. For that permit, current state and federal rules adequately address enforceability. Please see response below.

*Specifically, for MK2, although the BART NOx emission limits and monitoring requirements are stated in Env-A 2300, this rule points to permit conditions for the associated testing requirements. Also, although the rule includes BART TSP emission limits and stack testing requirements for MK2, there are no associated monitoring requirements included in the rule.*

*In addition, the rule relies on permit conditions for the $SO_2$ BART emission limits and testing requirements for MK2, and does not include any $SO_2$ monitoring requirements for MK2.*

*For MK1, Env-A 2300 relies on permit conditions for the NOx and $SO_2$ emission limits and testing requirements, and is silent as to the associated monitoring requirements. In addition, although the rule includes TSP emission limits and testing requirements for MK1, the rule is silent as to the associated monitoring requirements.*

*Therefore, since the Merrimack Station permits are not valid, and Env-A 3200 [sic] does not include all of the necessary emission limits, monitoring, and testing requirements, the DES will need to ensure that the deficient aspects noted above are addressed in the final SIP submittal, in order to ensure that all of the BART and reasonable further progress limits for Merrimack Station are enforceable.*

- **NHDES Response:** The monitoring, recordkeeping, and reporting requirements for Units MK1 and MK2 that are listed in both the Temporary Permit and the proposed Title V Operating Permit are based on existing federal and state requirements specified in one or more of the following regulations: 40 CFR Part 75 (federal CEM requirements), Env-A 800 (state testing and monitoring procedures), and Env-A 900 (state recordkeeping and reporting requirements). Both Env-A 800 and Env-A 900 are elements of New Hampshire's SIP. Merrimack Station is subject to these provisions regardless of the status of the Title V Operating Permit or Env-A 2300 (state regional haze rule). Moreover, NHDES anticipates that the proposed Title V Operating Permit will be issued in final form well before the BART implementation date of July 1, 2013. In summary, NHDES believes that Env-A 2300 already provides for the requisite monitoring and testing of emissions for enforcement of BART. Note that the inclusion of Unit MK1 in New Hampshire's regional haze rule was done for practical reasons related to BART compliance (the two units will share a common stack) and was not meant to address reasonable further progress, although that may be an additional benefit.

*Furthermore, for Newington Station, the final SIP submittal should indicate which provisions of the Attachment II permit are to be incorporated into the SIP. For example, the permit includes a 2% sulfur content by weight fuel oil requirement for NT1 that has since been superseded by the 0.5 lb/MMBtu limit in Env-A 3200 [sic]. In such a case, the provision in the permit should not be incorporated into the SIP.*

- **NHDES Response:** The New Hampshire Code of Administrative Rules, Env-A 100 et seq., Rules Governing the Control of Air Pollution, and the permits issued by NHDES in accordance with those rules, contain many examples of overlapping requirements. The most stringent conditions always apply. In the present example, Unit NT1 must meet both the 2% maximum sulfur requirement *and* the 0.50 lb/MMBtu $SO_2$ limitation. Because the latter standard is the more stringent, it will be the governing condition. Env-A 609.19 includes provisions for reopening permits for cause, but the example cited would not meet any of the criteria for reopening the existing Title V operating permit. NHDES believes that overlapping requirements, redundancies, etc. are most easily addressed by amending the permit upon renewal (in this case, no later than March 31, 2012).

## CALPUFF Modeling Assessment

In its first regional haze State Implementation Plan (SIP) draft submitted to the Environmental Protection Agency (EPA) and the federal land managers (FLMs) for comment, the New Hampshire Department of Environmental Services (NHDES) used an alternative model (CALGRID) to provide visibility improvement estimates for potential best available retrofit technology (BART) emission controls. Both EPA and the FLMs requested that DES redo the analysis with the "preferred" model, CALPUFF, as it was anticipated that the model would provide higher visibility benefit estimates for each potential BART control scenario. NHDES provided the requested CALPUFF modeling results in its official final filing to EPA in January, 2010. During a March 2010 meeting between EPA and NHDES, EPA requested additional documentation to support the modeling results and requested that a full year be modeled to better represent the visibility benefits due to NOx emission controls during periods of cold weather. NHDES revisited this modeling as requested and found that the modeling results did not change substantively.

On April 21, 2010, NHDES provided a general description of the proposed CALPUFF modeling procedures to EPA for comment. In that communication, NHDES let EPA know that it planned to exercise some flexibility as allowed under guidance to better represent more realistic estimates of anticipated visibility benefits for potential BART controls. NHDES used CALPUFF as specified in the BART guidance; however, rather than allowing the model to calculate deciviews from default data, NHDES applied relative modeling changes to monitored extinction to deciview relationship data to determine more realistic deciview predictions for the New England airshed. On August 6, 2010, EPA provided brief comments expressing concern and confusion regarding the proposed NHDES process (see attached). NHDES had subsequent telephone discussions with EPA regarding how New Hampshire intended to use the modeling in a relative way. EPA also asked whether it was appropriate to introduce current monitoring data since the blend of atmospheric species in 2064 is likely to be very different than it is now. NHDES took this question to the Cooperative Institute for Research in the Atmosphere (CIRA) for its thoughts on the matter. Based on CIRA's input, NHDES slightly revised the methodology to take a more speciated approach and calculated extinction before introducing the monitoring data into the calculations. This approach was incorporated into the NHDES analysis and is described in greater detail below.

EPA also expressed concern regarding NHDES's interpretation of the EPA BART modeling guidance. The concern focused on the wording for using the 20% worst modeled days, which NHDES interpreted to mean 20% worst visibility days since the two correlate so highly in the northeast region of the country. This interpretation also made logical sense to NHDES since the regional haze rule targets visibility improvement on those 20% worst visibility days while maintaining current visibility on the 20% best days. As was recently pointed-out, EPA's intent was to use the worst (or maximum) modeled BART source impacts as applied to the best visibility days. The wording of the guidance has been made clearer since its draft version, but having been told that the guidance had not been changed substantively, NHDES did not notice its misinterpretation until recently. NHDES's continued misinterpretation of the modeling guidance is demonstrated in the April 2010 correspondence between NHDES and EPA, where EPA recommends the use of the 98$^{th}$ percentile data (for BART source modeling) and NHDES responds by asking if this was for the 98$^{th}$ percentile worst days of monitoring (see attached NHDS-EPA correspondence). Now with a correct interpretation of the guidance, NHDES provides the requested CALPUFF modeled data for the 20% best visibility days in addition to the 20% worst visibility days. Even though these new results have been added, it is NHDES's opinion that any benefits predicted based on the 20% best visibility days are not likely to be

realized in 2018 because of the wind patterns in the area and the alignment of sources with Class I areas. Given the alignment of the New Hampshire BART source to Class 1 areas and how there is a strong correlation of this alignment with that wind direction for worst visibility days, NHDES believes that the data provided for the 20% worst visibility days is a much more realistic prediction for anticipated benefits of controls, than the estimate for the 20% best days.

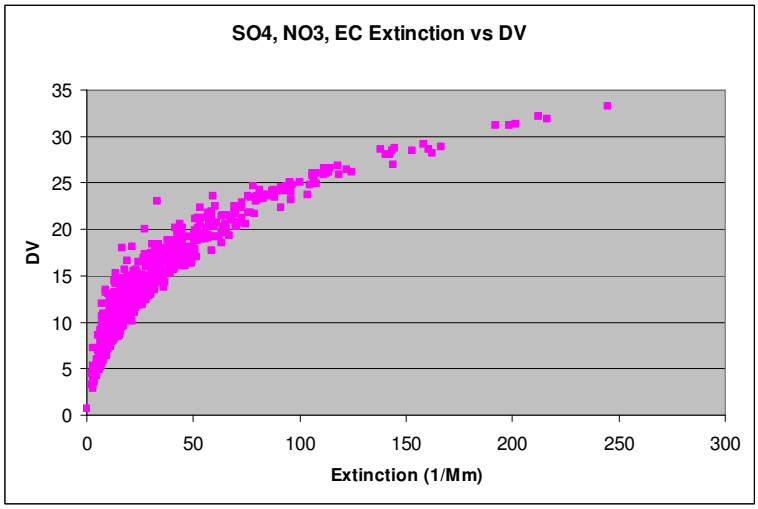
Additional process description and data are provided in sections below.

## Description of the NHDES Modeling Process

The EPA modeling guidelines suggest that using models in a "relative" way could be useful to estimate the expected visibility benefits of BART controls. As explained above, while CALPUFF is EPA's preferred model for visibility assessments of individual sources, it still has some weaknesses. NHDES prefers the relative approach to improve the non-linear (deciview) visibility assessment with actual response data measured at nearby Class 1 areas rather than using national default data.

As specified by guidance, the NHDES modeling uses CALPUFF to estimate the benefits of BART controls on a single source under the conditions of 20% best (and worst visibility days). The model calculates the concentration benefits from the chosen source controls, but the conversion of the data into deciview units involves a non-linear estimation heavily dependent on background air pollution levels which can vary greatly in species concentrations. The resulting concentrations were normalized to match the scale of the previously submitted MANE-VU CALPUFF modeling to ensure consistency and comparability with the original MANE-VU modeling platform. Next, the normalized modeled species concentrations were used to calculate predicted visibility extinctions using the EPA-recommended reconstructed extinction equation. Finally, these results were used to calculate design values based on a best-fit equation for observed design value to extinction data for nearby New England Class I areas (Acadia NP, Great Gulf NWR, and Lye Brook NWR) (see Figure 1). Because of the logarithmic relationship of deciviews and concentration, background visibility must be added to the modeled concentrations prior to the extinction calculation so that the correct portion of the curve is applied. Extinctions corresponding to 20% best visibility days at Acadia NP (12.4 dv), Great Gulf / Presidential Range (12.0 dv) and Lye Brook (11.7 dv) were used. 22.8 dv was used for 20% worst visibility days.

**Figure 1. Monitored $PM_{2.5}$ Extinction to Deciview Relationship in the Northeast**



In short, the CALPUFF post-processor (CALPOST) uses a generic blend of background visibility conditions and then performs deciview benefit calculations in a crude way based on specification of background conditions. NHDES's approach rigorously assesses relative changes predicted in CALPUFF modeling with (monitor-based) monitoring data derived visibility benefits. The NHDES approach allows visibility calculations to be made at any level of background visibility within the range of observed data at the nearby Class 1 areas.

EPA guidelines recommend the use of five years of meteorology for BART modeling. Further, in order to prevent a single outlier from dominating the process, the 98$^{th}$ percentile single source impact should be used for BART determination. Because NHDES has only one year of meteorology suitable for regional CALPUFF modeling, it was decided to use the single maximum impact for that one year. This reduced the likelihood that a higher 98$^{th}$ percentile was missed and ensured that conservative results were used.

*Emission Scenarios:*

Each leading BART control option was modeled for visibility benefit at nearby Class I areas. However, scenarios were not modeled where affected units are currently operating at lower emission rates, or at rates equal to potential BART emission limits. If there are no actual emission reductions to be gained from lower emission limits, then there are no benefits that would result through modeling.

*CALPUFF Modeling Inputs and Assumptions*
The inputs and assumptions that were used in the CALPUFF BART visibility impact modeling are listed below.

*Models Used*
CALPUFF Version 6.262
CALPOST Version 6.221
CALPro Standard 6.4.0.05_27_2008 Graphical User Interface

*Meteorology*
CALMET 1990 (full year) meteorological field produced by NHDES on 8/26/2005

## Reason for NHDES Process

While recognizing that CALPUFF is the recommended model for long distance visibility assessments for Class I areas, NHDES disagrees with EPA that CALPUFF provides the best and most useful predictions of the visibility benefit of BART controls. CALPUFF excels at predicting worst-case impacts in the mid- to long-field, thus looking for that maximum point, and it does reasonably well at predicting that related concentration. It does not do as well in predicting the related deciview impact because the model is not wired to match a facility's impact with the actual background visibility for any specific day. Instead, the worst-case concentration is simply added to a generalized model background concentration for a deciview target specified in a model post-processor (CALPOST). This is perhaps the purpose of the exercise, to be conservative and theoretical rather than to produce a truly realistic anticipated benefit. As a result, it does not track realistic modeled impacts as they might relate to background visibility, best visibility, and worst visibility days. Extra effort by the modeler is needed to present a realistic modeling result that aligns wind directions with appropriate, manually entered background conditions.

Because the model handles wind fields without regard to visibility conditions, CALPUFF's predictions can be very conservative and possibly oversensitive to changes in visibility conditions when assessing the most likely benefits of emission controls. In the case of the New Hampshire BART sources, the alignment of the sources to the most affected Class I area (Acadia N.P.) is also the direct alignment of the most common wind trajectory on worst visibility days; thus maximum source contributions occur at times when transported air pollution from further away is also at a maximum. This phenomenon can lead to some of the worst visibility days. This alignment also makes it very difficult for NH BART sources to contribute maximum impacts at times when impacts from additional transport are not occurring, which would be the case on best visibility days. Therefore, when the best visibility day results are artificially overlaid on maximum source impact days and then the modeling results are used to calculate the benefits of emission controls, those benefits can be unrealistically overstated. As a result, predicted deciview improvements and the calculated cost-per-deciview ($/dv) BART control metric are not truly anticipated or expected. If a control is deemed reasonable because full attention is given to a scenario that is unlikely ever to occur based on monitored observations, NHDES questions the validity of calling the modeled results as an "anticipated benefit." The exception to this case, however, is Lye Brook: because of its location in southern Vermont and its alignment with NH BART sources, the impacts from those sources are likely to be highest at Lye Brook on best visibility days when winds are from the east. Therefore, for Lye Brook, the predictions for best visibility days may be reasonable.

EPA recommends and encourages states to use the CALPUFF model for BART modeling, largely because regional models have not yet been proven to be effective for modeling impacts from individual sources. However, unlike CALPUFF and other dispersion models, regional grid models such as CALGRID excel at accounting for the impacts of widespread sources contributing to the species that cause visibility impairment. To that end, for the impact assessment of New Hampshire's BART-eligible sources, NHDES originally chose to use CALGRID, the sister model to CALPUFF. CALGRID includes much of the same chemistry as CALPUFF but uses gridded dispersion as opposed to the puff dispersion used in CALPUFF. In fact, CALGRID2.45 includes about 20 percent more enhanced aerosol chemistry than CALPUFF and is therefore considered to be the more advanced model. Moreover, CALGRID easily matches and isolates the 20% best and worst visibility days to allow a direct, realistic result without the need for manual modeling adjustments to account for those specifics. CALGRID can easily isolate the best visibility days where a BART source actually contributes to visibility impairment, giving a more realistic sense of what benefits are reasonably anticipated. CALPUFF always assumes maximum emissions impact at Class I areas on both best and worst days – conditions that may or may not happen in reality. While the CALPUFF model's CALPOST post-processor has an option for application on 20% best visibility days, it does not isolate those 20% best days for analysis. It simply changes the background values used by the model to what is estimated to be appropriate background conditions. The post-processed results do not account for wind directions that may be preferentially included or excluded on such days. Even though NHDES sees value in the application of CALGRID for identifying anticipated visibility impacts with consideration to daily contributions of a single source relative to all sources, NHDES has agreed to also apply the CALPUFF model. NHDES still applies significant credibility to the CALGRID modeling results because they provide substantial insight into what scenarios are most realistic and just how much benefit is likely to occur in a given year.

## CALPUFF Modeling Results

*Merrimack Station Unit MK2: BART Eligibility Modeling*

The BART eligibility modeling conducted by MANE-VU used natural visibility conditions (about 7 dv) to produce the most conservative modeling results to minimize sources from modeling out of BART. Under natural background conditions, uncontrolled emissions from Unit MK2 produce CALPUFF worst-case impacts of 2.24 dv at Acadia National Park. This value was replicated in the NHDES CALPUFF modeling effort. EPA considers it acceptable to exempt sources when this form of conservative modeling indicates that a source produces less than 0.5 dv of impact. MANE-VU considers an exemption level of 0.2 to 0.3 dv to be more appropriate but prefers, and has applied, a more conservative exemption level of 0.1 dv. CALPUFF modeling results for baseline emissions from Unit MK2 exceed all of these exemption levels.

According to EPA regional haze documentation, a difference of 1 deciview is visibly noticeable by observers and a difference of 0.1dv is the minimum perceptible by the human eye.

*Merrimack Station Unit MK2: BART Benefit Assessment Modeling*

> The BART assessment modeling provides a comparison of visibility impacts from current allowable emissions with those from the post-control emission level (or levels) being evaluated. In accordance with EPA guidance, NHDES used CALPUFF to estimate the magnitude of the source's impacts on visibility after implementation of BART controls. Results are tabulated for the average of the 20% best and worst visibility (in this case, about 11.7 to 12.4 dv for best and 22.8 dv for worst) modeled days at each nearby Class I area. For any pair of control levels evaluated, the difference in the level of impairment predicted is the degree of improvement in visibility expected.

For Merrimack Station Unit MK2, the CALPUFF-predicted visibility benefits from BART controls on 20% best and 20% worst visibility days are shown below.

**CALPUFF Modeling Results for Merrimack Station Unit MK2:**
**Visibility Improvements from BART Controls**

| **On the 20% Best Visibility Days (deciviews)** | | | | |
|---|---|---|---|---|
| **Pollutant** | **Control Level** | **Acadia** | **Great Gulf** | **Lye Brook** |
| $SO_2$ | 90% with FGD | 1.07 | 0.83 | **0.17** |
| NOx | Additional 25% with SCR upgrade | 0.21 | 0.18 | **0.10** |
| PM | 90% with upgraded controls | 0.16 | 0.12 | **0.03** |
| **On the 20% Worst Visibility Days (deciviews)** | | | | |
| **Pollutant** | **Control Level** | **Acadia** | **Great Gulf** | **Lye Brook** |
| $SO_2$ | 90% with FGD | **0.26** | **0.20** | 0.03 |
| NOx | Additional 25% with SCR upgrade | **0.07** | **0.06** | 0.03 |
| PM | 90% with upgraded controls | **0.07** | **0.05** | <0.01* |

* below sensitivity limit of model

Note: Values in **boldface** are considered as having greater validity in the modeling estimation of maximum visibility benefits from BART controls.

While Unit MK2 was predicted by the MANE-VU modeling to have up to 2.24 dv impact at Acadia National Park under natural conditions, the basis of the BART assessment evaluation changes to 20% worst visibility days. On those days, a 90% reduction in sulfur emissions at Unit MK2 results in only a maximum of 0.26 dv visibility improvement. At first these results may appear to be too low; however, on further examination, it is found that CALPUFF predicts the same amount of sulfate from Unit MK2 reaching Acadia under both best and worst visibility conditions. The difference is that there is greater than an order of magnitude more background sulfate coming from other sources on the 20% worst visibility days, raising the background concentrations (and deciviews) to much higher levels. Because the deciview scale is logarithmic, the same mass reduction of 0.259 $\mu g/m^3$ of sulfate from this one source results in wide differences in deciview impacts for different background visibility conditions at opposite ends of the range.

On the 20% best visibility days, if the full impact (or benefit of control for the FGD) could somehow be realized at nearby Class I areas without the influence of regional transport from other sources, then the benefit could be as high as 1.07 dv. NHDES does not believe this 1.07 dv of benefit is a realistic expectation for this SIP, which focuses on 2018.

**Detailed CALPUFF Modeling Results for Merrimack Station Unit MK2 for 20% Best Days:**

| 20% Best Days Load | Acadia DV Base | Acadia DV Control | Acadia DV Benefit | Acdia DV Source Contribution | Great Gulf DV Base | Great Gulf DV Control | Great Gulf DV Benefit | Great Gulf DV Source Contribution | Lye Brook DV Base | Lye Brook DV Control | Lye Brook DV Benefit | Lye Brook DV Source Contribution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MK2 Base | 14.65 | 14.65 | - | 2.25 | 13.81 | 13.81 | - | 1.81 | 12.31 | 12.31 | - | 0.61 |
| MK2 FGD | 14.65 | 13.57 | **1.07** | 1.17 | 13.81 | 12.98 | **0.83** | 0.98 | 12.31 | 12.14 | **0.17** | 0.44 |
| MK2 SNCR | | | | | | | | | | | | |
| MK2 SCR Upgrade | 14.65 | 14.44 | **0.21** | 2.04 | 13.81 | 13.62 | **0.18** | 1.62 | 12.31 | 12.21 | **0.097** | 0.51 |
| MK2 Baghouse | 14.65 | 14.98 | **(0.33)** | 2.58 | 13.81 | 14.07 | **(0.26)** | 2.06 | 12.31 | 12.37 | **(0.06)** | 0.67 |
| MK2 ESP Upgrade | 14.65 | 14.49 | **0.16** | 2.09 | 13.81 | 13.69 | **0.12** | 1.68 | 12.31 | 12.28 | **0.03** | 0.58 |

**Detailed CALPUFF Modeling Results for Merrimack Station Unit MK2 for 20% Worst Days:**

| 20% Worst Days Load | Acadia DV Base | Acadia DV Control | Acadia DV Benefit | Acdia DV Source Contribution | Great Gulf DV Base | Great Gulf DV Control | Great Gulf DV Benefit | Great Gulf DV Source Contribution | Lye Brook DV Base | Lye Brook DV Control | Lye Brook DV Benefit | Lye Brook DV Source Contribution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MK2 Base | 23.85 | 23.85 | - | 1.02 | 23.58 | 23.58 | - | 0.76 | 24.72 | 24.72 | - | 1.89 |
| MK2 FGD | 23.85 | 23.59 | **0.26** | 0.76 | 23.58 | 23.38 | **0.20** | 0.56 | 24.72 | 24.68 | **0.03** | 1.86 |
| MK2 SNCR | | | | | | | | | | | | |
| MK2 SCR Upgrade | 23.85 | 23.78 | **0.07** | 0.95 | 23.58 | 23.52 | **0.06** | 0.70 | 24.72 | 24.69 | **0.03** | 1.86 |
| MK2 Baghouse | 23.85 | 23.99 | **(0.14)** | 1.16 | 23.58 | 23.69 | **(0.11)** | 0.87 | 24.72 | 24.74 | **(0.02)** | 1.91 |
| MK2 ESP Upgrade | 23.85 | 23.78 | **0.07** | 0.96 | 23.58 | 23.53 | **0.05** | 0.71 | 24.72 | 24.71 | **0.009** | 1.88 |

The above analysis indicates that CALPUFF and CALGRID have aligned better in their predictions than might be expected on worst visibility days. As presented in earlier drafts of the New Hampshire regional haze SIP, CALGRID predicted a maximum visibility benefit of about 0.1 dv (on the more realistic worst visibility days vs. 0.26 dv on the best visibility days) at Acadia National Park for a 90% reduction in $SO_2$ emissions. This result may be attributed to the similar chemistry used in both models and to the specific circumstances of this case in which the prevailing wind direction on the 20% worst visibility days carries Unit MK2 emissions directly toward Acadia National Park. The big discrepancy occurs under best visibility days, when CALGRID does not account for meteorology that brings significant New Hampshire BART source contributions to nearby Class I areas on best visibility days.

*Newington Station Unit NT1: BART Eligibility Modeling*

The BART eligibility modeling conducted by MANE-VU used natural visibility conditions (about 7 dv) to produce the most conservative modeling results to minimize sources from modeling out of BART. Under natural background conditions, uncontrolled emissions from Unit

NT1 produce theoretical CALPUFF worst-case impacts of 1.22 dv at Acadia National Park. As in the case of Unit MK2, CALPUFF modeling results for baseline emissions from Unit NT1 exceed all of the EPA and MANE-VU exemption levels.

*Newington Station Unit NT1: BART Benefit Assessment Modeling*

For Newington Station Unit NT1, the CALPUFF-predicted visibility benefits from BART controls on 20% best and 20% worst visibility days are smaller than those for Merrimack Station Unit MK2:

**CALPUFF Modeling Results for Newington Station Unit NT1:**
**Visibility Improvements from BART Controls**

| **On the 20% Best Visibility Days (deciviews)** | | | | |
|---|---|---|---|---|
| **Pollutant** | **Control Level** | **Acadia** | **Great Gulf** | **Lye Brook** |
| $SO_2$ | FGD (90% sulfur reduction*) | 0.57 | 0.45 | **0.09** |
| | 1.0%-S residual fuel oil (50% sulfur reduction*) | 0.30 | 0.24 | **0.05** |
| | 0.5%-S residual fuel oil (75% sulfur reduction*) | 0.46 | 0.36 | **0.07** |
| | 0.3%-S residual fuel oil (85% sulfur reduction*) | 0.52 | 0.40 | **0.08** |
| | 0.50 lb $SO_2$/MMbtu (77% sulfur reduction*) | 0.47 | 0.37 | **0.08** |
| | *Switch from 0.50 lb $SO_2$/MMbtu emission limit to 0.3%S residual fuel oil* | *<0.05* | *0.03* | ***<0.01****** |
| NOx | SNCR (25% NOx reduction**) | 0.11 | 0.10 | **0.04** |
| | SCR (78% NOx reduction**) | 0.34 | 0.30 | **0.12** |
| PM | Baghouse (85% PM reduction**) | 0.05 | 0.04 | **0.01** |
| **On the 20% Worst Visibility Days (deciviews)** | | | | |
| **Pollutant** | **Control Level** | **Acadia** | **Great Gulf** | **Lye Brook** |
| $SO_2$ | FGD (90% sulfur reduction*) | **0.13** | **0.10** | <0.01*** |
| | 1.0%-S residual fuel oil (50% sulfur reduction*) | **0.07** | **0.06** | <0.01*** |
| | 0.5%-S residual fuel oil (75% sulfur reduction*) | **0.11** | **0.09** | 0.01 |
| | 0.3%-S residual fuel oil (85% sulfur reduction*) | **0.13** | **0.10** | 0.01 |
| | 0.50 lb $SO_2$/MMbtu (77% sulfur reduction*) | **0.11** | **0.09** | 0.01 |
| | *Switch from 0.50 lb $SO_2$/MMbtu emission limit to 0.3%S residual fuel oil* | ***0.01*** | ***0.01*** | *<0.01*** |
| NOx | SNCR (25% NOx reduction**) | **0.04** | **0.03** | 0.01 |
| | SCR (78% NOx reduction**) | **0.11** | **0.10** | 0.03 |
| PM | Baghouse (85% PM reduction**) | **0.02** | **0.02** | <0.01*** |

* from maximum permitted level

** from baseline level with existing controls

*** below sensitivity limit of model

Note: Values in **boldface** are considered as having greater validity in the modeling estimation of maximum visibility benefits from BART controls.

As presented in an earlier draft of the New Hampshire regional haze SIP, CALGRID predicted a maximum negligible visibility benefit (less than 0.1 dv) at Acadia National Park for a 75% reduction in $SO_2$ emissions.

**Detailed CALPUFF Modeling Results for Newington Station Unit NT1 for 20% Best Days:**

| 20% Best Days Load | Acadia DV Base | Acadia DV Control | Acadia DV Benefit | Acdia DV Source Contribution | Great Gulf DV Base | Great Gulf DV Control | Great Gulf DV Benefit | Great Gulf DV Source Contribution | Lye Brook DV Base | Lye Brook DV Control | Lye Brook DV Benefit | Lye Brook DV Source Contribution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NT1 Base** | 13.62 | 13.62 | **-** | 1.22 | 12.99 | 12.99 | **-** | 0.99 | 11.98 | 11.98 | **-** | 0.28 |
| **NT1 1% S** | 13.62 | 13.32 | **0.30** | 0.92 | 12.99 | 12.75 | **0.24** | 0.75 | 11.98 | 11.93 | **0.05** | 0.23 |
| **NT1 0.5% S** | 13.62 | 13.16 | **0.46** | 0.76 | 12.99 | 12.63 | **0.36** | 0.63 | 11.98 | 11.91 | **0.07** | 0.21 |
| **NT1 0.50 lb SO2/MMBtu** | 13.62 | 13.15 | **0.47** | 0.75 | 12.99 | 12.62 | **0.37** | 0.62 | 11.98 | 11.91 | **0.08** | 0.21 |
| **NT1 0.3% S** | 13.62 | 13.10 | **0.52** | 0.70 | 12.99 | 12.59 | **0.40** | 0.58 | 11.98 | 11.90 | **0.08** | 0.20 |
| **NT1 FGD** | 13.62 | 13.05 | **0.57** | 0.65 | 12.99 | 12.54 | **0.45** | 0.54 | 11.98 | 11.89 | **0.09** | 0.19 |
| **NT1 SNCR** | 13.62 | 13.51 | **0.11** | 1.11 | 12.99 | 12.89 | **0.10** | 0.89 | 11.98 | 11.94 | **0.04** | 0.24 |
| **NT1 SCR** | 13.62 | 13.28 | **0.34** | 0.88 | 12.99 | 12.69 | **0.30** | 0.69 | 11.98 | 11.86 | **0.12** | 0.16 |
| **NT1 ESP (real)** | 13.62 | 13.08 | **0.54** | 1.11 | 12.99 | 12.56 | **0.43** | 0.89 | 11.98 | 11.87 | **0.12** | 0.24 |
| **NT1 Baghouse** | 13.62 | 13.03 | **0.05** | 1.11 | 12.99 | 12.51 | **0.04** | 0.89 | 11.98 | 11.86 | **0.01** | 0.24 |

**Detailed CALPUFF Modeling Results for Newington Station Unit NT1 for 20% Worst Days:**

| 20% Worst Days Load | Acadia DV Base | Acadia DV Control | Acadia DV Benefit | Acdia DV Source Contribution | Great Gulf DV Base | Great Gulf DV Control | Great Gulf DV Benefit | Great Gulf DV Source Contribution | Lye Brook DV Base | Lye Brook DV Control | Lye Brook DV Benefit | Lye Brook DV Source Contribution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NT1 Base** | 23.42 | 23.42 | **-** | 0.59 | 23.24 | 23.24 | **-** | 0.42 | 24.61 | 24.61 | **-** | 1.79 |
| **NT1 1% S** | 23.42 | 23.34 | **0.07** | 0.52 | 23.24 | 23.19 | **0.06** | 0.36 | 24.61 | 24.61 | **0.008** | 1.78 |
| **NT1 0.5% S** | 23.42 | 23.31 | **0.11** | 0.48 | 23.24 | 23.16 | **0.09** | 0.33 | 24.61 | 24.60 | **0.01** | 1.78 |
| **NT1 0.50 lb SO2/MMBtu** | 23.42 | 23.30 | **0.11** | 0.48 | 23.24 | 23.15 | **0.09** | 0.33 | 24.61 | 24.60 | **0.01** | 1.78 |
| **NT1 0.3% S** | 23.42 | 23.29 | **0.13** | 0.47 | 23.24 | 23.14 | **0.10** | 0.32 | 24.61 | 24.60 | **0.01** | 1.78 |
| **NT1 FGD** | 23.42 | 23.28 | **0.13** | 0.46 | 23.24 | 23.14 | **0.10** | 0.31 | 24.61 | 24.60 | **0.01** | 1.78 |
| **NT1 SNCR** | 23.42 | 23.38 | **0.04** | 0.56 | 23.24 | 23.21 | **0.03** | 0.38 | 24.61 | 24.60 | **0.01** | 1.78 |
| **NT1 SCR** | 23.42 | 23.31 | **0.11** | 0.48 | 23.24 | 23.14 | **0.10** | 0.32 | 24.61 | 24.58 | **0.03** | 1.76 |
| **NT1 ESP (real)** | 23.42 | 23.19 | **0.23** | 0.56 | 23.24 | 23.06 | **0.18** | 0.38 | 24.61 | 24.58 | **0.04** | 1.78 |
| **NT1 Baghouse** | 23.42 | 23.17 | **0.02** | 0.56 | 23.24 | 23.04 | **0.02** | 0.38 | 24.61 | 24.57 | **0.003** | 1.78 |

*Emissions and Reduction Scenarios as Follows:*

**Maximum Source Contributions to Nearby Class I Areas after Potential BART Controls at MK2 on 20% Best Visibility Days**

| BART Controls | Control Level (%) | CALPUFF Source Contribution (DV) Highest 24-Hour Period |
|---|---|---|
| $SO_2$ Lower S Coal (ex) | 40 | 2.25 |
| NOx SCR (ex) | 85 | |
| PM Two ESPs (ex) | 99+ | |
| $SO_2$ FGD | 90 | 1.17 |
| NOx SCR Upgrade | to 90 | 2.04 |
| PM ESP Upgrade | 99.5 | 2.09 |

Note: Currently permitted emissions produced a CALPUFF visibility impact of 2.25 dv on 20% Best visibility days.

**Maximum Source Contributions to Nearby Class I Areas after Potential BART Controls at NT1 on 20% Best Visibility Days**

| BART Controls | Control Level (%) | CALPUFF Source Contribution (DV) Highest 24-Hour Period |
|---|---|---|
| 2% S Oil (from existing 1.5%) | 0 | 1.22 |
| NOx overfire (ex) | 33 | |
| PM ESPs (ex) | 42 | |
| $SO_2$ FGD | 90 | 0.63 |
| $SO_2$ 1% S (from 1.5%) | 50 | 0.92 |
| $SO_2$ 0.5% S | 75 | 0.76 |
| $SO_2$ 0.3% S | 85 | 0.70 |
| $SO_2$ 0.50 lb $SO_2$/MMBtu | 77 | 0.75 |
| NOx SNCR | 50 | 1.11 |
| NOx SCR | 85 | 0.88 |
| PM Fabric Filters | 99 | 1.11 |

Note: Currently permitted emissions produced a CALPUFF visibility impact of 1.22 dv on 20% Best visibility days.

Federal Register Modeling recommendations (FR 69/87 May 5, 2004)

Page 25193
For modeling an individual BART-eligible source located more than 50 km from a Class I area, we propose that an air quality model, such as CALPUFF be used.

Page 25194
Converting a 5 percent change in light extinction to a change in deciviews yields a change of approximately 0.5 deciviews. This is a natural breakpoint at which to set the exemption level, since visibility degradation may begin to be recognized by human observer at this extinction level. Thus we are proposing a 0.5 deciview change as the threshold for determining that an individual source is causing visibility impairment at a Class I area. This level would be calculated by measuring the air quality screening modeling results for an individual source against natural visibility conditions.

Page 25189 and Page 25203
For assessing the 5$^{th}$ factor, the degree of improvement in visibility from various BART control levels, we are proposing that States require individual sources to run CALPUFF, or other EPA-approved model, using site-specific data. To estimate a source's impact on visibility, the source would run the model using current allowable emissions, and then again at the post-control emissions level (or levels) being assessed. Results would then be tabulated for the average of the 20% worst modeled days at each receptor. The difference in the resulting level of impairment predicted is the degree of improvement in visibility expected.

## Attachment:

## Email Communication with EPA Region 1 Regarding BART Modeling

-----Original Message-----
From: mcwilliams.anne@epamail.epa.gov
[mailto:mcwilliams.anne@epamail.epa.gov]
Sent: Friday, August 06, 2010 1:22 PM
To: Healy, David
Subject: Fw: PSNH BART Modeling with CALPUFF

Hi Dave,

I have concerns regarding the approach to BART visibility impact modeling proposed in Jeff's e-mail of 4/20/10 (below). In this e-mail, NHDES is proposing to determine visibility improvement from installation of controls in respect to current background conditions.

> " The changes in predicted concentrations (with and without control) were converted to changes in visibility (DV) using the logarithmic relationship between DV and concentrations at the regional Class 1 areas (based on actual monitoring data collected from 1996 to 2008)."

CFR Part 51, Appendix Y clearly states:

> "For each source, run the model, at pre-control and post-control emission rates according to the accepted methodology in the protocol. Use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled (for the pre-control scenario). Calculate the model results for each receptor as the change in deciviews compared against natural visibility conditions."

The goal of the Regional Haze Rule is to return the Class 1 areas to natural visibility conditions by 2064. By calculating the expected visibility improvements of BART controls based on current conditions, the analysis is not supporting this goal. Furthermore, if the BART determination is based on current conditions, the impact of that source on visibility in the Class 1 areas will increase over time as the influence of other sources are lessen through the installation of controls, once again leading to a failure to adequately assess the impact of BART controls for that source on the Class 1 area.

Anne

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Five Post Office Square - Suite 100
Mail Code - OEP05-02
Boston, MA 02109-3912

----- Forwarded by Anne McWilliams/R1/USEPA/US on 08/06/2010 12:56 PM -----

From: "Underhill, Jeff" <Jeffrey.Underhill@des.nh.gov>
To: Anne McWilliams/R1/USEPA/US@EPA
Cc: "Healy, David" <David.Healy@des.nh.gov>
Date: 04/20/2010 03:30 PM
Subject: RE: PSNH BART Modeling with CALPUFF

Anne,
I'm having a little trouble understanding the 98th percentile approach you describe below. Are you referring to the 98th percentile (8th highest DV day) based on monitoring for baseline year (2002), for annual CALPUFF modeling with all sources, or for maximum impact days for the BART facility in question?

NHDES took a different approach to this CALPUFF modeling since I have concerns with how the model actually works. I have to believe that the NH alternative approach gives realistic results that are supported by traditional science, but the approach is different which may cause you concern for consistency. The guidance for modeling does provide latitude and I believe we are within that guidance.

While we are working on a more formal write-up, I can briefly describe the process to you. CALPUFF was used to model the NH BART sources with and without controls. A full year of met data was used. Maximum predicted 24-hour concentrations for the source were isolated for each Class 1 area. The changes in predicted concentrations (with and without control) were converted to changes in visibility (DV) using the logarithmic relationship between DV and concentrations at the regional Class 1 areas (based on actual monitoring data collected from 1996 to 2008). This last step provides for the application of using the model in a relative way as preferred by EPA guidance. For BART exemption purposes, a background visibility of 7DV (natural conditions) was used to define the set point and for 20% worst days, the baseline 22.8DV submitted with the SIP was used. These set points reflected the location on the DV to concentration logarithmic relationship curve to use a starting point for visibility impact benefit assessment.

We chose this approach because CALPUFF uses a generic approach to calculating DVs based on national averages. I would suggest that our use of actual regional IMPROVE monitoring is more scientifically rigorous and defendable based on the nature of our prevailing mix of concentrations.

So, if I have a question in here somewhere, it would be, would you prefer that we capture CALPUFF's 8th highest impact for the year (instead of the 1st highest) to use for our assessment? Or would you prefer that we use the 8th worst visibility day for the baseline year (2002) to use as background DV? I think we have the second option relatively well covered by using the baseline value which is the average of the 20% worst days.

Thanks!
Jeff

-----Original Message-----
From: Healy, David
Sent: Friday, April 16, 2010 4:31 PM
To: Underhill, Jeff
Subject: FW: PSNH BART Modeling with CALPUFF

Hi again, Jeff. FYI, here are some communications that I've been having with Anne McWilliams.

Dave

-----Original Message-----
From: mcwilliams.anne@epamail.epa.gov
[mailto:mcwilliams.anne@epamail.epa.gov]
Sent: Friday, April 16, 2010 4:22 PM
To: Healy, David
Subject: RE: PSNH BART Modeling with CALPUFF

Hi Dave,

Many of the BART visibility protocols call for the visibility change expected on the 8th highest 24 hr visibility impact day (98th percentile) due to the installation of control. This value was used in conjunction with the use of 3 yrs of meteorology. In discussions with Maine and Massachusetts, we have discussed using the change in visibility due to installation of controls on highest impacted day when only using 1 yr of meteorology. However, several of the sources still included the change in visibility impact for the 8th highest visibility impacted day.

Anne

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